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## SEX-LIMITED INHERITANCE AND SEXUAL DIMORPHISM IN POULTRY

WHEN a Barred Rock hen is bred to a non-barred, *e. g.*, black, cock, all the female offspring are non-barred, all the male barred. This generation, then, is sexually dimorphic. The offspring of the reciprocal mating is not dimorphic, since all the offspring are barred. For reasons which will appear in a moment, I wish to repeat the usual formulæ for this case; B standing for barred; b for non-barred, *e. g.*, uniform black.

Barred Rocks: male, B♂ B♂; female, B♂ b♀.

Non-barreds: male, b♂ b♂; female, b♂ b♀.

A. Barred females by non-barred male gives in F<sub>1</sub>,

barred males, B♂ b♂; gametes, B♂ b♂;

and non-barred females, b♂ b♀; gametes, b♂ b♀.

Inbred they give in F<sub>2</sub>, barred males, B♂ b♂;

non-barred males, b♂ b♂;

barred females, B♂ b♀;

non-barred females, b♂ b♀.

B. Non-barred females by barred male give in F<sub>1</sub>,

barred males, B♂ b♂; gametes, B♂ b♂;

and non-barred females, b♂ b♀; gametes, B♂ b♀.

Inbred they give in F<sub>2</sub>, barred males, { B♂ B♂;

of two sorts, viz., { B♂ b♂;

barred females, B♂ b♀;

non-barred females, b♂ b♀.

Now barring is a dominant character. If, however, it is treated as a recessive, *i. e.*, patent only in the homozygous condition, some suggestive results follow. In the first place the Barred Rocks become sexually dimorphic in respect to barring, for the male, being homozygous, will be barred, but the female being heterozygous will be non-barred. Moreover, this dimorphism will continue indefinitely in succeeding generations.

When this hypothetical dimorphic breed is bred reciprocally to a uniform black breed, all the F<sub>1</sub> offspring will be non-barred and the usual signs of sex-limited inheritance will be lacking. The F<sub>2</sub> generation, as shown under A, will all be non-barred, and of those under B only one fourth will be barred and these all males.

This hypothetical case offers a plausible explanation of the mode of inheritance of sexual dimorphism. However, this case, while

possible, is probably simpler than any likely to be encountered in actual experience. Moreover, the greater the number of different factors involved, the more the observed ratios will obscure the hypothetical ratios.

The following experiments are interesting in this connection:

First may be recorded the results of crossing Brown Leghorns and Buff Plymouth Rocks. The former's plumage or some of its elements is known to follow a sex-limited mode of inheritance. Of the mating Buff Rock females by Brown Leghorn male only chicks in the down are on hand, but they are exactly like the chicks of the reciprocal mating. The adults of this last mating are reddish buff in both sexes without the usual features of sex-limited inheritance. In F<sub>2</sub> true buffs appeared and various other colors (among them the Rhode Island red color) but no true Brown Leghorns. The detailed theoretical formulation must await the results of other matings, but compare under A above. Chicks in the down of the mating F<sub>1</sub> female by Buff Rock male are on hand. None of these, unlike many of the F<sub>1</sub> chicks, are striped. The absence of striped chicks indicates an absence of the heterozygous form.

In the second place are to be recorded the results of castration experiments on young Brown Leghorns. Though not yet old enough to show all the adult characters, the castrated males are assuming the male juvenile plumage, which, it should be noted, is almost as sharply differentiated from the female's juvenile plumage as the adult male's is from the adult female's. The castrated females, on the contrary, have already assumed a considerable part of the male's juvenile plumage.

These experiments indicate that a recessive character, sex limited in inheritance, can, according to the formulæ given above, be utilized in an explanation of the mode of inheritance of sex dimorphism. On the other hand, a dominant sex-limited character, at least in poultry, does not lead in this direction.

While it is probable that the plumage of the male Brown Leghorn is a homozygous recessive, and the female heterozygous, it is

not certain what the dominant element or factor is. It may be female Brown Leghorn color, a modifier, or femaleness or something else. As females colored nearly like Brown Leghorn females appeared among black females in  $F_1$  from Brown Leghorn males by White Rock females it suggests that the dominant element is not female color.

A similar inference may be drawn from the distribution of color in the buff and black non-barred  $F_1$  females from White or Barred Rock females by Buff Rock male. Some of these are black with orange hackle and grade into others in which buff predominates. In all cases the colors are distributed in a more or less perfect imitation of the pattern of Brown Leghorn females. Moreover, many of these hybrids are stippled in certain regions which always correspond to the regions in Brown Leghorns which are stippled.

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#### THE NORTH CAROLINA ACADEMY OF SCIENCE

THE tenth annual meeting of the North Carolina Academy of Science was held at the Agricultural and Mechanical College, Raleigh, on April 28 and 29, 1911, with an attendance of forty members. The meeting of the executive committee, held in the early afternoon of April 28, was followed by a general meeting for the reading of papers. At night, after the academy had been welcomed to the Agricultural and Mechanical College by President D. H. Hill, the retiring president of the academy, Professor W. H. Pegram, delivered his presidential address, "The Problem of the Constitution of Matter." Following this, Professor John F. Lanneau gave a lecture on "Sirius: the Bright and Morning Star."

On Saturday morning, April 29, the annual business meeting was had. Reports of the secretary-treasurer and of the various committees were made. Five new members were elected. These together with the present membership of 80 give a total of 85 members. The report of the secretary-treasurer showed that the academy in membership, in the interest shown in its work, and in its finances, was in better condition than at any time during its history.

The following officers were elected for the ensuing year:

*President*—H. V. Wilson, University of North Carolina, Chapel Hill.

*Vice-president*—W. A. Withers, Agricultural and Mechanical College, West Raleigh.

*Secretary-treasurer*—E. W. Gudger, State Normal College, Greensboro.

*Executive Committee*—J. J. Wolfe, Trinity College, Durham; Franklin Sherman, Jr., Department of Agriculture, Raleigh; Andrew H. Patterson, University of North Carolina, Chapel Hill.

At 10 A.M. the academy and the North Carolina Section of the American Chemical Society held a joint meeting at which Dr. R. A. Hall, of the University of North Carolina, read a report on "The Chemical Researches of Ehrlich Leading to '606.'" Following this, reading of papers on the academy program was resumed. At 2 P.M., the program being finished, the academy adjourned to the dining room of the college, where a luncheon was given complimentary to the visiting members.

The total attendance was forty out of a membership of eighty-five. There were thirty-three papers on the program, all of which were read save two, and all read when called for but two. In attendance, number of papers presented, general interest as evidenced by the discussion of the papers, this session excelled any in the history of the academy. In addition to the presidential address, which is published in full in the current number of the *Journal of the Elisha Mitchell Scientific Society*, and to the lecture on Sirius, the following papers were presented:

*Catching Hawk Moths on Flowers at Dusk*: C. S. BRIMLEY, Raleigh.

This paper tells the author's experiences in catching hawk moths on flowers at dusk in several years at Raleigh, N. C. The flowers first experimented with were jimson weed, afterwards four-o'clocks. With the jimson weeds it was found that tying the flowers in bunches was an advantage, while this did not apply to the four-o'clocks, as they were already in bunches. Two flights of moths were noted, the first in June, the second in July and later, the latter largely, the former wholly composed of moths from over-wintering pupæ. The proportion of sexes visiting flowers was 5 males to 2 females. A neighbor's cat was found to be as expert a catcher of hawk moths on flowers as the author. The notes apply mainly to the two tobacco hawk moths.